

Cord blood-derived neuronal cells by ectopic expression of Sox2 and c-Myc.

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Public Summary:

The finding that certain somatic cells can be directly converted into cells of other lineages by the delivery of specific sets of transcription factors paves the way to novel therapeutic applications. This process is also known reprogramming by direct conversion, because a cell from a specific lineage (ex. cord blood) changes its internal program to become a cell from a different lineage (ex. neurons). Here we show that a specific subset of human cord blood cells can be converted into neuronal cells by the expression of a pluripotent transcription factor called Sox2. This process is further augmented by the addition of another factor called c-Myc. Gene-expression and electrophysiological analysis show that the converted cells acquire a distinct neuronal fate characterized by the expression of multiple neuronal markers. Converted cells show the ability to fire action potentials after in vitro maturation as well as after in vivo transplantation into the mouse hippocampus. This system highlights the potential of human cord blood cells and offers alternative means to the study of cellular plasticity, possibly in the context of drug screening research and of future cell-replacement therapies.

Scientific Abstract:

The finding that certain somatic cells can be directly converted into cells of other lineages by the delivery of specific sets of transcription factors paves the way to novel therapeutic applications. Here we show that human cord blood (CB) CD133(+) cells lose their hematopoietic signature and are converted into CB-induced neuronal-like cells (CB-iNCs) by the ectopic expression of the transcription factor Sox2, a process that is further augmented by the combination of Sox2 and c-Myc. Gene-expression analysis, immunophenotyping, and electrophysiological analysis show that CB-iNCs acquire a distinct neuronal phenotype characterized by the expression of multiple neuronal markers. CB-iNCs show the ability to fire action potentials after in vitro maturation as well as after in vivo transplantation into the mouse hippocampus. This system highlights the potential of CB cells and offers an alternative means to the study of cellular plasticity, possibly in the context of drug screening research and of future cell-replacement therapies.

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